REMARKS

This is a full and timely response to the final Office Action mailed by the U.S. Patent and Trademark Office on August 3, 2006. Claims 1-39 remain pending in the present application. In view of the following remarks, reconsideration and allowance of the application and all pending claims are respectfully requested.

Each rejection presented in the Office Action is discussed in the remarks that follow.

Rejections Under 35 U.S.C. § 102

Claims 1, 2, 13, 20-21, 27 and 31 stand rejected under 35 U.S.C. § 102(a) as allegedly being anticipated by Bellotti *et al.*, Cross-Phase Modulation Suppressor for Multi-Span Dispersion Managed WDM Transmission, ECOC '99, 26-30 September 1999, Nice, France (hereafter *Bellotti*). A proper rejection of a claim under 35 U.S.C. § 102 requires that a single prior art reference disclose each element of the claim. *See, e.g., W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983).

Bellotti discloses a system that minimizes the group velocity delay (GVD) of an n-channel transmission over a plurality of consecutive fiber spans, each span being followed by a GVD compensating module. *See Bellotti*, page I-204, col. 1. Specifically, *Bellotti* states "[i]n brief, located preferably within each repeater, XPM [cross-phase modulation] suppressors introduce delays t between adjacent channels, such that the total differential delays, t_d at the beginning of the following fiber span (i.e., taken into account the time shifts due to the residual GVD and GVD slope) are preferably all identical to the optimal delays of Fig. 2." *See Bellotti*, page I-205, col. 1. *Bellotti* continues "[w]hen this condition is met, the XPM/IN experienced by the two neighbouring channels #(n-1) and #(n+1) of a given channel n is minimized. Simultaneously, the time delays of the more distant channels, which give lower contributions because of walk off/2/, fall in the region of incoherent addition." *See Bellotti*, page I-205, col. 1. From this it is clear that *Bellotti* discloses a system for compensating for dispersion over multiple consecutive fiber spans.

Indeed, Figs. 1(a) and 1(c) of *Bellotti* illustrate a compensation system that realigns two channels over multiple consecutive fiber spans.

Importantly, nowhere does *Bellotti* disclose, teach or suggest dispersion compensation over a plurality of wavelengths in what the Applicants have described as "inter-wavelength" compensation where individual wavelengths are relatively delayed to reduce inter-wavelength spectral dispersion of the optical signal across the wavelengths. *See* Application, page 3, lines 17-18. Further, Applicants' dispersion compensation elements alter the timing of a signal portion on each of a plurality of wavelengths, where the dispersion compensation elements operate on all wavelengths simultaneously to reduce inter-wavelength spectral dispersion across the wavelengths. *See* Application, page 3, line 23 to page 4, line 2. Applicants respectfully submit that their invention provides spectral dispersion compensation simultaneously and concurrently on each wavelength and across all wavelengths. *See* Application, page 11, lines 10-12.

With particular regard to the claims, *Bellotti* fails to disclose, teach or suggest at least Applicants' apparatus for spectral dispersion compensation in an optical communication network, comprising "a demultiplexer adapted to receive the plurality of wavelengths and divide the plurality of wavelengths into individual wavelengths, the individual wavelengths relatively delayed by a respective dispersion compensation element, each dispersion compensation element, having a different delay characteristic, to reduce inter-wavelength spectral dispersion and to synchronize each portion of the signal with respect to time across the plurality of wavelengths," as recited in claim 1.

Similarly, *Bellotti* fails to disclose, teach or suggest at least Applicants' method for spectral dispersion compensation in an optical network comprising "simultaneously altering the relative timing among the wavelengths using a dispersion compensation element associated with each wavelength, each dispersion compensation element having a different delay characteristic, to reduce inter-wavelength spectral dispersion and to synchronize the distributed signal with respect to time across the plurality of wavelengths," as recited in claim 13.

Bellotti also fails to disclose, teach or suggest at least Applicants' apparatus for spectral dispersion compensation in an optical network comprising "means for

simultaneously altering the relative timing of the wavelengths, each means having a different delay characteristic, to reduce inter-wavelength dispersion and to synchronize the distributed signal with respect to time across the plurality of wavelengths," as recited in claim 20.

Similarly, *Bellotti* fails to disclose, teach or suggest at least Applicants' spectral dispersion compensator for an optical signal distributed over a plurality of wavelengths comprising "plural dispersion compensation elements for adjusting the relative timing of all of the wavelengths concurrently, each dispersion compensation element having a different delay characteristic, and for synchronizing the spatially divided optical signal with respect to time across the plurality of wavelengths," as recited in claim 27.

Bellotti also fails to disclose, teach or suggest at least Applicants' method for spectral dispersion compensation for an optical signal distributed over a plurality of wavelengths comprising "adjusting the relative timing of all of the wavelengths concurrently using a dispersion compensation element for each wavelength, each dispersion compensation element having a different delay characteristic, and for synchronizing the spatially divided optical signal with respect to time across the plurality of wavelengths," as recited in claim 31.

Accordingly, Applicants respectfully submit that independent claims 1, 13, 20, 27 and 31 are allowable over *Bellotti*, and furthermore, that dependent claims 2 and 21, which depend directly from allowable independent claims, are allowable for at least the reason that they depend from allowable independent claims. In re *Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1998).

Rejections Under 35 U.S.C. § 103

Claims 3-6 and 14

Claims 3-6 and 14 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over *Bellotti* in view of U.S. Patent No. 6,567,587 to Kashihara *et al.* (hereafter *Kashihara*). For a claim to be properly rejected under 35 U.S.C. § 103, "[t]he PTO has the burden under section 103 to establish a *prima facie* case of obviousness. It can satisfy this burden only by showing some objective teaching in the prior art or that

knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references." *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988) (Citations omitted). Further, "[t]he mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." *In re Fritch*, 972 F.2d 1260, 1266, 23 U.S.P.Q.2d 1780 (Fed Cir. 1992).

As stated above, *Bellotti* discloses a system that minimizes the group velocity delay (GVD) of an n-channel transmission over a plurality of consecutive fiber spans, each span being followed by a GVD compensating module. *See Bellotti*, page I-204, col. 1. Specifically, *Bellotti* states "[i]n brief, located preferably within each repeater, XPM [cross-phase modulation] suppressors introduce delays t between adjacent channels, such that the total differential delays, t_d at the beginning of the following fiber span (i.e., taken into account the time shifts due to the residual GVD and GVD slope) are preferably all identical to the optimal delays of Fig. 2." *See Bellotti*, page I-205, col. 1. *Bellotti* continues "[w]hen this condition is met, the XPM/IN experienced by the two neighbouring channels #(n-1) and #(n+1) of a given channel n is minimized. Simultaneously, the time delays of the more distant channels, which give lower contributions because of walk off/2/, fall in the region of incoherent addition." *See Bellotti*, page I-205, col. 1. From this it is clear that *Bellotti* discloses a system for compensating for dispersion over multiple consecutive fiber spans. Indeed, Figs. 1(a) and 1(c) of *Bellotti* illustrate a compensation system that realigns two channels over multiple consecutive fiber spans.

Kashihara discloses a dispersion compensator with Bragg gratings which have a dispersion compensating function and are formed on output waveguides of an arrayed waveguide grating, and a dispersion-compensating module employing the dispersion compensator. *See Kashihara*, Abstract. According to *Kashihara*, "the output waveguides 7 each have the Bragg grating 7b which has the dispersion compensation function." *See Kashihara*, col. 3, lines 28-30. *Kashihara* continues stating "[i]n this context, the light, which are demultiplexed according to their wavelengths and output

into the different output waveguides 7, are reflected off each of the Bragg gratings 7b and dispersion compensated. Then, the light pass through the same path in reverse fashion to be multiplexed and are then output from one of at least one input waveguide 3 as wavelength-multiplexed light." *See Kashihara*, col. 3, lines 30-37.

Kashihara discloses a dispersion compensator with Bragg gratings which have a dispersion compensating function and are formed on output waveguides of an arrayed waveguide grating, and a dispersion-compensating module employing the dispersion compensator, which operates on a single wavelength.

Specifically, the proposed combination fails to disclose, teach or suggest at least Applicants' spectral dispersion compensation apparatus and method that compensates for spectral dispersion across a plurality of wavelengths.

With regard to independent claim 1, Applicants respectfully submit that the proposed combination fails to disclose, teach or suggest at least Applicants' optical device comprising "a demultiplexer adapted to receive the plurality of wavelengths and divide the plurality of wavelengths into individual wavelengths, the individual wavelengths relatively delayed by a respective dispersion compensation element, each dispersion compensation element having a different delay characteristic to reduce inter-wavelength spectral dispersion and to synchronize each portion of the signal with respect to time across the plurality of wavelengths."

With regard to independent claim 13, Applicants respectfully submit that the proposed combination fails to disclose, teach or suggest at least Applicants' step of "simultaneously altering the relative timing among the wavelengths using a dispersion compensation element associated with each wavelength, each dispersion compensation element having a different delay characteristic, to reduce inter-wavelength spectral dispersion and to synchronize the distributed signal with respect to time across the plurality of wavelengths."

Accordingly, Applicants respectfully submit that independent claims 1 and 13 are patentably distinct over the proposed combination of *Bellotti* and *Kashihara*. Further, dependent claims 3-6 and 14 are allowable for at least the reason that they depend either directly or indirectly from allowable independent claims. *In re Fine, supra.*

Claims 1-8, 10-16, 18-23, 25-29, 31-32 and 34

Claims 1-8, 10-16, 18-23, 25-29, 31-32 and 34 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over *Kashihara* in view of *Bellotti*.

As stated above, *Kashihara* discloses a dispersion compensator with Bragg gratings which have a dispersion compensating function and are formed on output waveguides of an arrayed waveguide grating, and a dispersion-compensating module employing the dispersion compensator. *See Kashihara*, Abstract. According to *Kashihara*, "the output waveguides 7 each have the Bragg grating 7b which has the dispersion compensation function." *See Kashihara*, col. 3, lines 28-30. *Kashihara* continues stating "[i]n this context, the light, which are demultiplexed according to their wavelengths and output into the different output waveguides 7, are reflected off each of the Bragg gratings 7b and dispersion compensated. Then, the light pass through the same path in reverse fashion to be multiplexed and are then output from one of at least one input waveguide 3 as wavelength-multiplexed light." *See Kashihara*, col. 3, lines 30-37.

Kashihara discloses a dispersion compensator with Bragg gratings which have a dispersion compensating function and are formed on output waveguides of an arrayed waveguide grating, and a dispersion-compensating module employing the dispersion compensator, which operates on a single wavelength.

As stated above, *Bellotti* discloses a system that minimizes the group velocity delay (GVD) of an n-channel transmission over a plurality of consecutive fiber spans, each span being followed by a GVD compensating module. *See Bellotti*, page I-204, col. 1. Specifically, *Bellotti* states "[i]n brief, located preferably within each repeater, XPM [cross-phase modulation] suppressors introduce delays t between adjacent channels, such that the total differential delays, t_d at the beginning of the following fiber span (i.e., taken into account the time shifts due to the residual GVD and GVD slope) are preferably all identical to the optimal delays of Fig. 2." *See Bellotti*, page I-205, col. 1. *Bellotti* continues "[w]hen this condition is met, the XPM/IN experienced by the two neighbouring channels #(n-1) and #(n+1) of a given channel n is minimized. Simultaneously, the time delays of the more distant channels, which give lower contributions because of walk off/2/, fall in the region of incoherent addition." *See*

Bellotti, page I-205, col. 1. From this it is clear that *Bellotti* discloses a system for compensating for dispersion over multiple consecutive fiber spans. Indeed, Figs. 1(a) and 1(c) of *Bellotti* illustrate a compensation system that realigns two channels over multiple consecutive fiber spans.

Importantly, nowhere does the proposed combination disclose, teach or suggest dispersion compensation over a plurality of wavelengths in what the Applicants have described as "inter-wavelength" compensation where individual wavelengths are relatively delayed to reduce inter-wavelength spectral dispersion of the optical signal across the wavelengths. *See* Application, page 3, lines 17-18. Further, Applicants' dispersion compensation elements alter the timing of a signal portion on each of a plurality of wavelengths, where the dispersion compensation elements operate on all wavelengths simultaneously to reduce inter-wavelength spectral dispersion across the wavelengths. *See* Application, page 3, line 23 to page 4, line 2. Applicants respectfully submit that their invention provides spectral dispersion compensation simultaneously and concurrently on each wavelength and across all wavelengths. *See* Application, page 11, lines 10-12.

With particular regard to the claims, the proposed combination fails to disclose, teach or suggest at least Applicants' apparatus for spectral dispersion compensation in an optical communication network, comprising "a demultiplexer adapted to receive the plurality of wavelengths and divide the plurality of wavelengths into individual wavelengths, the individual wavelengths relatively delayed by a respective dispersion compensation element, each dispersion compensation element, having a different delay characteristic, to reduce inter-wavelength spectral dispersion and to synchronize each portion of the signal with respect to time across the plurality of wavelengths," as recited in claim 1.

Similarly, the proposed combination fails to disclose, teach or suggest at least Applicants' method for spectral dispersion compensation in an optical network comprising "simultaneously altering the relative timing among the wavelengths using a dispersion compensation element associated with each wavelength, each dispersion compensation element having a different delay characteristic, to reduce inter-wavelength

spectral dispersion and to synchronize the distributed signal with respect to time across the plurality of wavelengths," as recited in claim 13.

The proposed combination also fails to disclose, teach or suggest at least Applicants' apparatus for spectral dispersion compensation in an optical network comprising "means for simultaneously altering the relative timing of the wavelengths, each means having a different delay characteristic, to reduce inter-wavelength dispersion and to synchronize the distributed signal with respect to time across the plurality of wavelengths," as recited in claim 20.

Similarly, the proposed combination fails to disclose, teach or suggest at least Applicants' spectral dispersion compensator for an optical signal distributed over a plurality of wavelengths comprising "plural dispersion compensation elements for adjusting the relative timing of all of the wavelengths concurrently, each dispersion compensation element having a different delay characteristic, and for synchronizing the spatially divided optical signal with respect to time across the plurality of wavelengths," as recited in claim 27.

The proposed combination also fails to disclose, teach or suggest at least Applicants' method for spectral dispersion compensation for an optical signal distributed over a plurality of wavelengths comprising "adjusting the relative timing of all of the wavelengths concurrently using a dispersion compensation element for each wavelength, each dispersion compensation element having a different delay characteristic, and for synchronizing the spatially divided optical signal with respect to time across the plurality of wavelengths," as recited in claim 31.

Accordingly, Applicants respectfully submit that independent claims 1, 13, 20, 27 and 31 are patentably distinct over the proposed combination of *Kashihara* and *Bellotti*. Further, dependent claims 2-8, 10-12, 14-16, 18-19, 21-23, 25-26, 28-29, 32 and 34 are allowable for at least the reason that they depend either directly or indirectly from allowable independent claims. *In re Fine, supra.*

Claims 9, 17, 24, 30, 33 and 35-39

Claims 9, 17, 24, 30, 33 and 35-39 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over *Kashihara* in view of *Bellotti* and further in view of U.S. Patent no. 6,628,864 to Richardson *et al.* (hereafter *Richardson*).

As stated above, *Kashihara* discloses a dispersion compensator with Bragg gratings which have a dispersion compensating function and are formed on output waveguides of an arrayed waveguide grating, and a dispersion-compensating module employing the dispersion compensator, which operates on a single wavelength.

As stated above, *Bellotti* discloses a system that minimizes the group velocity delay (GVD) of an n-channel transmission over a plurality of consecutive fiber spans, each span being followed by a GVD compensating module. *See Bellotti*, page I-204, col. 1. Specifically, *Bellotti* states "[i]n brief, located preferably within each repeater, XPM [cross-phase modulation] suppressors introduce delays t between adjacent channels, such that the total differential delays, t_d at the beginning of the following fiber span (i.e., taken into account the time shifts due to the residual GVD and GVD slope) are preferably all identical to the optimal delays of Fig. 2." *See Bellotti*, page I-205, col. 1. *Bellotti* continues "[w]hen this condition is met, the XPM/IN experienced by the two neighbouring channels #(n-1) and #(n+1) of a given channel n is minimized. Simultaneously, the time delays of the more distant channels, which give lower contributions because of walk off/2/, fall in the region of incoherent addition." *See Bellotti*, page I-205, col. 1. From this it is clear that *Bellotti* discloses a system for compensating for dispersion over multiple consecutive fiber spans. Indeed, Figs. 1(a) and 1(c) of *Bellotti* illustrate a compensation system that realigns two channels over multiple consecutive fiber spans.

Richardson discloses an optical code division multiple access (OCDMA) coder:decoder grating. The modulated refractive index profile that makes up the OCDMA coder:decoder grating incorporates changes in polarity between OCDMA chips by discrete phase shifts, thereby to provide bipolar coding through phase modulation. *See Richardson*, abstract. However, *Richardson* fails to cure the defects of *Kashihara* and *Bellotti*.

Specifically, the proposed combination fails to disclose, teach or suggest at least Applicants' spectral dispersion compensation apparatus and method that compensates for spectral dispersion across a plurality of wavelengths.

With regard to independent claim 35, Applicants respectfully submit that the proposed combination fails to disclose, teach or suggest at least Applicants' optical device comprising "dispersion-correction means for introducing relative delays among the encoded components, each dispersion-correction means having a different delay characteristic, to yield dispersion-corrected and temporally synchronized encoded components across a plurality of wavelengths."

Accordingly, Applicants respectfully submit that independent claim 35 is patentably distinct over the proposed combination of *Kashihara*, *Bellotti* and *Richardson*. Further, dependent claims 9, 17, 24, 30, 33, 34 and 36-39 are allowable for at least the reason that they depend either directly or indirectly from allowable independent claims. *In re Fine, supra.*

CONCLUSION

For at least the foregoing reasons, Applicants respectfully request that all outstanding rejections be withdrawn and that all pending claims of this application be allowed to issue. If the Examiner has any comments regarding Applicants' response or intends to dispose of this matter in a manner other than a notice of allowance, Applicants request that the Examiner telephone Applicants' undersigned attorney.

Respectfully submitted,

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